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ABSTRACT

This study examined the effects of nutritional supplements on the duration and level of spontaneous play of 55 mildly to moderately malnourished toddlers living within the tea plantations of West Java, Indonesia. Infants were randomly assigned by their day care centers to one of three supplement groups: (1) energy and micronutrient supplements; (2) micronutrient plus skim milk; and (3) skim milk alone. After 6 months of supplementation, the children (age 24 months) were videotaped for 30 minutes playing with toys in their home with their caregiver present. The videotapes were coded for duration and frequency of four developmental levels of play behavior: manipulative, relational, functional, and symbolic play. Duration of time off-task, waiting before playing, breastfeeding, and time in social interaction were also coded. Findings indicated that girls demonstrated longer play duration and higher play level, independent of supplementation. There were consistent effects of supplementation on duration and interest in play. Children in the energy plus micronutrient supplementation group played with more toys, had longer activity spans, were less likely to breastfeed, and were less likely to engage in social interaction outside of play than children in other groups. Girls benefited from the supplementation more than boys. (Author/AS)

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EARLY SUPPLEMENTAL FEEDING AND SPONTANEOUS PLAY IN WEST JAVA, INDONESIA.

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Abstract

This study examines the effects of nutritional supplementation on duration and level of spontaneous play of 55 mildly to moderately malnourished children living within the tea planations of West Java, Indonesia. Children were randomly assigned by day care center to one of three supplementation groups: 1) Energy plus micronutrients, 2) Micronutrients plus skim milk, 3) Skim milk alone. After 6 months of supplementation when the children were 24 months old, they were videotaped for 30 minutes playing with toys in their home with their caregiver present. The videotapes were coded for duration and frequency of four developmental levels of play behavior—Manipulative play, Relational Play, Functional Play, and Symbolic Play. Duration of time spent off-task, waiting before playing, breastfeeding, and in social interaction were also coded. Independent of supplementation, girls demonstrated greater duration of play and higher level of play. There were also consistent effects of the supplementation on duration and interest in play. Children in the energy plus micronutrient supplementation group played with more toys, had longer activity 'spans', were less likely to breastfeed, and were less likely to engage in social interaction outside of play. Group by Sex interactions suggest that girls benefited more from the supplementation than boys.

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Introduction

Measures of duration and amount of play are indicators of the child's interest in active exploration of the environment and objects (Tamis-LeMonda & Bornstein, 1993, Sigman & Sena, 1993). Measures of sophistication or level of play are conceptually distinct and are hypothesized to index cognitive developmental processes. This qualitative progression of play denotes the child's progress in representation skills--the increasing degree of symbolic activity present in the child's play. Among populations where malnutrition is endemic, poor nutritional status among young children is associated with both comparatively reduced play and low levels of play (Graves, 1976, 1978; Lozoff, Klein, & Prabucki, 1986; Sigman, Neuman, Baksh, Bwibo, & McDonald, 1989; Wachs et al, 1993). This study proposes to explore the effect of early undernutrition on both of these aspects of play together within a design that can affirm causality.

Questions

- Does nutritional supplementation have an effect on the quantitative aspects of play—the amount of play and the child's interest in play?
- Does nutritional supplementation have an effect on the qualitative aspects of play—the child's developmental progression through increasingly sophisticated levels of play?

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Method

Design and location

This play study is a substudy of a larger longitudinal study of nutrition and behavior carried out in six tea plantations in West Java, Indonesia. Infants were randomly assigned to one of three nutritional interventions:

- Energy and micronutrient supplementation (Group E)
- Micronutrient supplementation (Group M)
- Skim milk alone (Group SM)

Randomization was carried out at the level of the infant's day care center, and supplementation took place at the day care center for six months.

Subjects

To be included in this study, infants within the tea plantations needed to be classified as wasted (weight for length one to two SD below reference standards for WHO) and stunted (length for age below one SD of the median of the same reference standards). Children meeting these requirements are considered mildly-to-moderately-malnourished—both mildly to moderately thin and mildly to moderately stunted

Play assessment and coding

When the children were 24-months-of-age they were videotaped in a 30 minute assessment of spontaneous play in their home with their caregivers present. The videotapes were coded for four categories of play behaviors generally viewed as emerging in a developmental progression with the lower levels appearing first: manipulative, relational, functional, and symbolic (Belsky & Most, 1981). Duration and frequency of play behaviors in each mutually exclusive category was coded from the videotapes using a computer program allowing for continuous coding.

Analysis

Two way ANOVAs with Group and Sex as factors were carried out to determine effect of treatment group on play outcomes. We also carried out Mantel-Haenszel χ^2 analyses on categorical variables.

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Play Outcome Variables

Quantity of Play

- **Percent duration of total play, of wait time before touching toys, of time offtask, of breastfeeding and of social interaction outside of play**
- **Total number of toys that child explores during the play observation.**
- **Play activity 'span'—the average length of time a child engages in a discrete activity or play level before changing to another.**

Quality of Play

Percent duration of each of the four levels of play in relation to the total time the child plays.

- **Manipulative play—simple object manipulations.**
- **Relational play—combining of two or more objects in a nonfunctional manner.**
- **Functional play—traditional use of an object or conventional combination of two objects.**
- **Symbolic play—complete distinction between objects and actions, pretense play.**

Play factors

Principal components factor analysis revealed two factors that correspond well to the two types of children's abilities hypothesized to underlay observed differences in play.

- ***play interest* weights heavily on amount of functional play, total number of toys played with and total time at play and has strong negative relationships with amount of time offtask and amount of 'wait' time.**
- ***play sophistication* weights heavily and positively on amount of symbolic play and has a strong negative weight with manipulative play.**

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Summary of Results

Children receiving the energy plus micronutrient supplement

- **played with more toys**
- **engaged in longer 'play spans'**
- **had higher *play interest* scores.**
- **were less likely to breastfeed during the play observation**
- **were less likely to engage in social interaction outside of play**

Independent of supplementation...girls within this population

- **played longer**
- **waited less before starting play**
- **explored more toys**
- **had higher *play interest* and *play sophistication* scores**
- **played more at high levels of play and less at low levels of play**

Group by Sex interactions for amount of play, amount of 'wait' time, and *play interest* scores suggest that energy plus micronutrient supplementation may have had more of a beneficial effect on play behavior for girls than for boys.

Children in the skim milk group engaged in significantly more symbolic play than children in the micronutrient group. This finding is puzzling.

Conclusions

Energy plus micronutrient supplementation affects the spontaneous play of the children. Multiple and consistent findings indicate that this impact centers on the quantitative indexes of play—the child's interest and involvement in play and exploration.

The effects of nutritional supplementation on play behaviors were more pervasive for girls. These results can be explained by different sensitivities to supplementation (for example, smaller caloric requirements for girls means that additional energy intake might be more likely to generate changes in behavior) (Engle & Levin, 1984). However, it has also been proposed that supplementation may have differential effects for boys and girls. Increases in energy for boys may result in increased 'masculine behaviors'—more aggression and more high activity and gross motor type activities (which would detract from play scores), while for girls, energy increases would lead to more focused behaviors (Barrett & Frank, 1987).

Some of the effects of nutritional status on play appeared related to aspects of fearfulness and emotional regulation. The less well nourished children were more likely to demonstrate behavioral inhibition (more wait time, less total playtime, fewer number of toys), and more likely to seek comfort from their caregiver (more interaction with caregivers, more breastfeeding) rather than play with the objects.

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Qualitative Play Measures

Percent	Group E Energy + Micronutrien M	Group E SD	Group M Micronutrient M	Group M SD	Group SM Skim Milk M	Group SM SD	Group	Sex	Grp*Sx	E vs M	E vs SM	M vs SM
							F					
Manipulative	36.63	21.48	31.55	12.32	37.84	18.9	0.17	14.04***	0.81	0.22	0	0.29
Male	48.21	22.26	38.65	10.66	42.09	17.13						
Female	21.83	6.19	25.45	10.73	28.28	20.29						
Relational	14.75	12.64	17.99	12.47	11.64	8.32	2.12	3.48*	0.01	0.91	1.15	4.14**
Male	17.17	15.16	21.39	9.51	13.28	8.96						
Female	11.63	8.53	15.08	14.63	7.96	5.48						
Functional	37.87	18.37	40.24	14.53	36.31	11.17	0.26	5.23**	1.82	0.04	0.25	0.45
Male	29.45	16.67	37.57	12.20	35.46	11.17						
Female	48.69	15.16	42.53	16.88	35.47	11.68						
Symbolic	10.37	12.74	8.16	11.64	12.63	13.33	2.23	15.64***	0.07	0.72	1.49	4.25**
Male	5.22	8.71	1.97	1.96	8.08	10.36						
Female	16.99	14.63	13.47	14.03	22.85	14.16						
Factor												
Play Sophistication	-0.11	0.75	-0.04	1.12	0.08	1.09	1.23	24.45***	0.02	0.02	1.59	1.83
Male	-0.60	0.40	0.71	0.34	-0.29	0.88						
Female	0.53	0.59	0.54	1.26	0.93	1.10						

*** = > .01 ** = > .05 *= > .10

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Quantitative Play Measures

	Group E Energy + Micronutrient		Group M Micronutrient		Group SM Skim Milk		Group	Sex	Grp*Sx	E vs M	E vs SM	M vs SM
	M	SD	M	SD	M	SD			*F*			
Total Play pct	88.73	12.16	91.02	6.82	85.99	9.67	1.46	3.22*	4.93**	0.68	0.22	0.12
Male	81.58	11.85	92.58	5.01	85.81	9.30						
Female	97.92	2.70	89.69	8.23	86.41	11.13						
'Wait' pct	6.46	8.11	2.96	4.15	5.8	6.61	0.84	9.84***	3.20**	1.55	0.11	1.03
Male	11.44	7.72	3.49	3.71	6.90	6.91						
Female	0.06	0.14	2.51	4.74	3.32	5.45						
# of Toys	22.69	7.55	21.84	5.74	17.38	9.61	2.04	5.28**	0.54	0.25	3.75*	1.65
Male	18.89	8.04	20.00	6.48	16.22	9.90						
Female	27.57	2.64	23.42	4.96	20.00	8.99						
'Offtask' pct	4.44	9.87	4.03	4.89	4.51	3.64	0.34	0.28	0.27	0.33	0.15	0.75
Male	6.98	12.80	3.54	3.55	4.56	3.79						
Female	1.18	1.77	4.46	6.10	4.39	3.51						
Play interest	0.13	1.28	0.4	0.63	-0.28	0.89	2.71*	3.92*	4.35**	0.25	2.88*	4.55**
Male	-0.56	1.27	0.46	0.51	-0.30	0.82						
Female	1.03	0.51	0.34	0.76	-0.23	1.10						
'Span'	98.53	25.97	74.52	17.09	86.44	35.70	2.62*	0.79	1.34	5.23**	1.62	1.57
Male	87.31	23.15	80.09	19.22	84.25	37.46						
Female	112.96	23.25	69.76	14.79	91.39	33.21						

*** = > .01 ** = > .05 *= > .10

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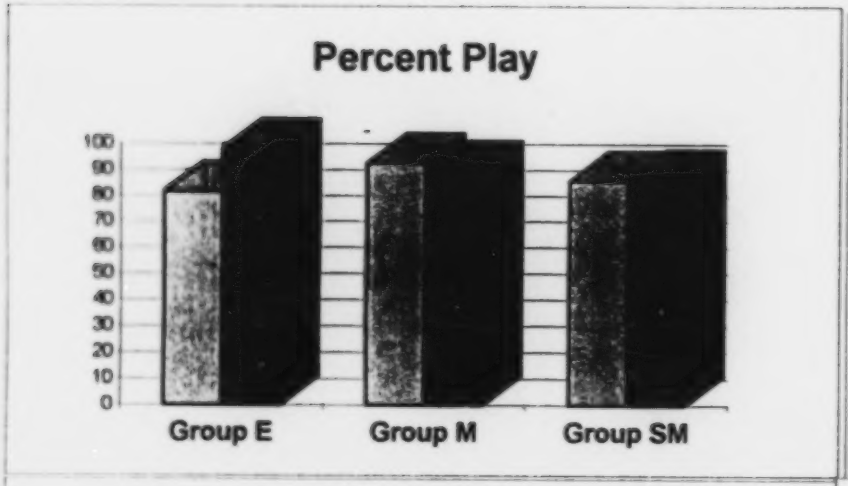

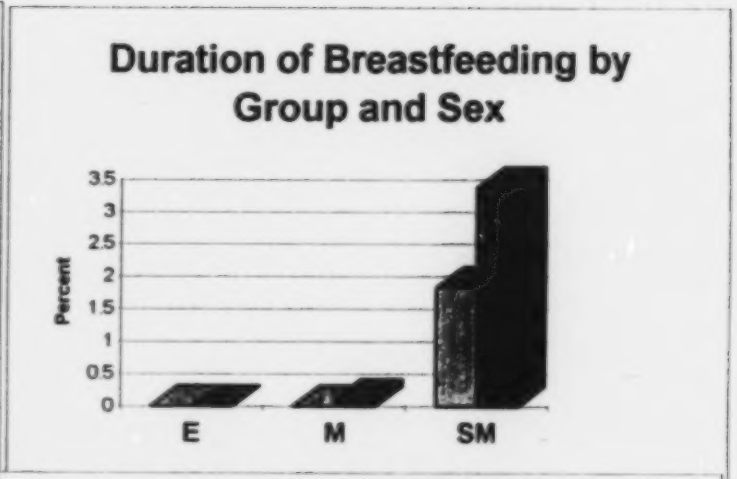

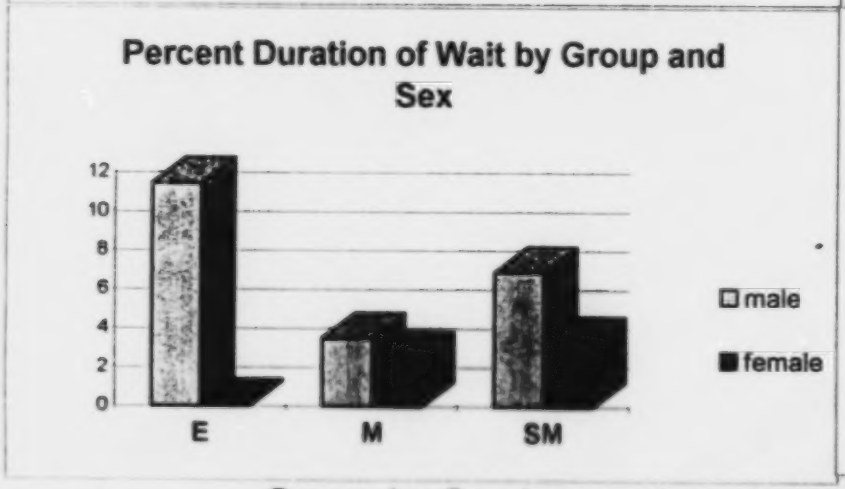

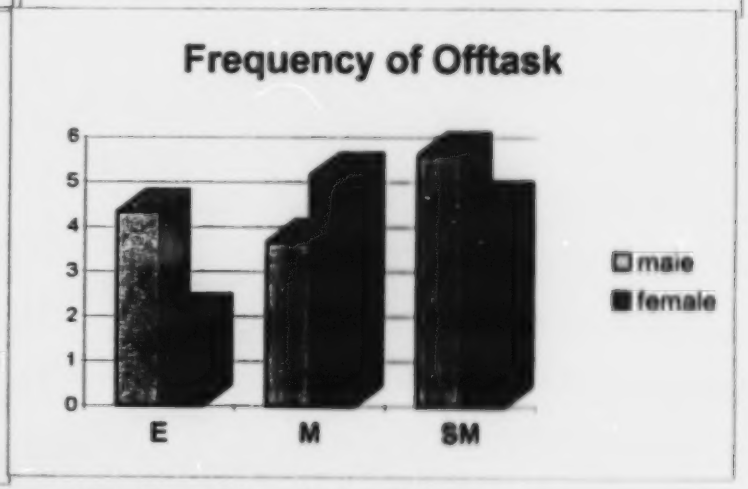

Group by Sex Interactions for Quantitative Play Variables

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